MANAGING ROAD TRAFFIC CONGESTION

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ABSTRACT

Congestion is not a new issue and is still a major problem to urban areas at present. The research aims to identify the causes and impacts of congestion. Besides, the research also discusses the role of government to improve the managing of road traffic congestion by few strategies in order to enhance the traffic flow. For the research methodology, the sources of data are focus on the primary data (observations) and secondary data which are mainly contribute by journal and internet resources. As conclusion, the research is expected will be useful to improve the managing road traffic congestion.

Keywords
Urban road traffic congestion, Supply and demand, Nature impacts, Reliability, Congestion reduction strategies

1.0 INTRODUCTION

Road traffic congestion poses a challenge to all growing urban areas. According to Meyer (1989), "traffic congestion means there are more people trying to use a given transportation facility during a specific period of time than the facility can handle with what are considered to be acceptable levels of delay or inconvenience". On the other words, congestion occurs when traffic volume demands for road space greater than the available road capacity.

There are two types of congestion such as recurrent congestion and non-recurrent congestion. According to OECD and ECMT (2004), "recurrent congestion is generally the consequence of factors that act regularly or periodically on the transportation system, such as daily commuting or weekend trips. Non-recurrent congestion is the effect of unexpected, unplanned or large events, for example, the road works, vehicle crashes, special events and so on that affect parts of the transportation system more or less randomly and, as such, cannot be easily predicted".

The occurrences of congestion are much more serious to the road users and give impacts which are contribute to longer and more unpredictable travel times and results in the increase of the cost of business. Moreover, congestion has an impact on both the speed of travel, nature impacts and on the reliability of services provided. Therefore, in order to mitigate congestion problems, it requires the techniques and good planning and also decision making.

1.1 Problem Statement

Road traffic congestion has been the significant problem for all big cities in urban areas. The purpose of the research is to identify the problems of occurrences (causes) of congestion. The causes of congestion are numerous, for example, there are too many vehicles using on the road's space and dynamic changes in roadway capacity. It also linked to the indirect factors such as car ownership, infrastructure investment and employment patterns. A growing problem of congestion in urban areas is due to increase of the population and economics as well as raise of the use of private cars and unbalance of supply and demand. Besides that, the problems that are often be the main issues of congestion are road factors, human factors, vehicle factors and accident factors.

1.2 Objectives

There are three objectives in the research. The first objective is to identify the causes of road traffic congestion. It is focuses on the causes such as unbalance transportation of supply and demand, road factors, human factors, vehicle factors and accident factors that lead to road traffic congestion. The second objective is to examine the impacts of road traffic congestion. The congestion leads to two negative impacts such as nature of impacts and impacts on reliability. Congestion has ability to directly impact on the reliability of the delivery services provided. If the frequent occurrence of congestion is higher, then the efficiency services provided would more and more lower especially in transportation. Lastly, the objective is to examine the management of the road traffic congestion. The government should have to put more effort on planning, implement and manage cost-effective strategies to deliver enhanced traffic flow and reliability.

2.0 LITERATURE REVIEW

In the research, it is focused on three parts; (1) causes of congestion; (2) congestion impacts; and (3) congestion reduction strategies.

2.1 Causes of Congestion

The causes of congestion have long been understood for all the road users and congestion occurs because of increase of population and economics, car ownership and infrastructure investment. Besides, it is mainly focused on unbalance of supply and demand, road factors, human factors, vehicle factors and accident factors. For the unbalance supply and demand factors, many of the causes of congestion are due to inadequate planning of road. "These causes include rising in population together with drift from rural areas to the city, unplanned land use which makes traffic flow unidirectional during the peak hours, wider car ownership due to improved standard of living, and inadequate public transport" (Aworemi *et. al*, 2009). Besides that, most of the causes of road traffic congestion are the condition of the roads. Road factors that lead to congestion can be category under geometric, pavement condition and control. "The road environment can however affect drivers' perceptions of both their own speed and of the appropriate speed for the road" (Edquist, 2009). Moreover, human such as drivers, pedestrians and cyclists are the primary elements in the road and must understand to be properly guided and controlled them. According to Aworemi *et. al* (2009), "individual behavior in traffic stream is frequently the factor which establishes the characteristics of that traffic". In addition, it is important to understand about the vehicle characteristics because it can affect a serious congestion without take any concern about this. The road should be such that it should cater to the needs of existing and anticipated of the vehicles. Lastly, the causes of road traffic congestion are the occurrence of the car accident. "Vehicle accidents can disrupt the normal flow of traffic, usually by physical impedance in the travel lanes" (Cambridge Systematics, 2008).

2.2 Congestion Impacts

2.2.1 Nature Impacts

Road traffic congestion effects on the economic goods and services in terms of business costs, productivity and output. "Economic costs of urban traffic congestion is at a very broad-brush level, demonstrating that congestion can affect business productivity through changes in travel time costs and the size of market areas that can be served from any given business location" (Weisbrod, and Fitzroy, 2008). Congestion has a range of nature impacts including logistics and trucking impacts, businesses impacts, impacts on worker travel, environment impacts and household impacts. "Congestion also can hurt economic development in individual regions by thwarting business attraction and expansion and reducing the quality of life for residents" (Cambridge Systematics, 2008).

2.2.2 Impacts on Reliability

"The event-related sources (traffic incidents, weather, and work zones) that contribute to total congestion also conspire to produce unreliable travel times, since events and demand volumes vary day to day" (Cambridge Systematics, 2004)**.** Traffic congestion has ability to directly impact on the efficiency of the delivery services provided. If the frequent occurrence of congestion is higher, then the efficiency of services provided would more and more lower especially transportation. The low efficiency of services provided would results in poor reliability of management.

2.3 Congestion Reduction Strategies

2.3.1 Build New Capacities

The government should increase supply through the creation of more capacities such as increasing the number and size of highways and lanes widening that can be used to deal with daily congestion problems. Most often the highways are new expressways which are provide the benefits of improving the transportation systems. Besides that, other benefits of building new highways could include a decrease in accidents by diverting traffic from poor roads and improved air quality by reducing the amount of traffic stop at intersections. Moreover, "lanes widening is often advocated as ways to reduce congestion" (Fadare and Ayantoyinbo, 2010). Lanes widening can occur in two ways which increasing the width of existing lanes and adding the new lanes. It could reduce serious congestion and provide the alternate routes for the travelers as well as improve freight and delivery schedules.

2.3.2 Improve Road Infrastructure

"Traffic control devices include traffic signs are the primary means of regulating, warning and guiding traffic on all roads and highways" (Meyer, 1989). Traffic signs are signs erected at the roadsides to provide information to the drivers. Traffic signs fall into three functional classification such as regulatory signs, warning signs and informational signs. Moreover, variable message signs are used to inform the drivers of instructions that are applicable only during the certain periods of the day or under certain traffic conditions. In addition, traffic markings

include all the road traffic lines, symbols, words, object markers or other devices that are used to attach to the pavement or mounted at the roadside in order to guide road traffic or warn of an obstruction.

2.3.3 Provide Transit Services

Public transportation is an important element of the transportation system in many areas in order to reduce congestion. "It is defined as all forms of high-occupancy and shared-ride services" (Meyer, 1989). Transit strategies can be divided into two basic types of services which are rail transit including transit ways and bus transit. Rail transit can move large numbers of persons in a fast, efficient and reliable condition. There are three types of rail services which can provide to the travelers such as heavy rail, light rail and commuter rail. Besides, buses are the most flexible form of transit. They can be re-routed or rescheduled quickly to meet changing of the travelers demand.

2.3.4 Exploit Technology System

The development of IT has an ability to help in vehicles movement more effectively on congested traffic. According to Asim (2012) cited by Sudharsan, & Sudheer Katta (2012) stated that "vehicle tracking system signifies the monitoring and management of vehicle, trucks and so on by using GPS system to get the current location, situation, history and control them". The system is very beneficial for delivery process because the drivers can avoid the road traffic congestion and reduce the cost and time delays and for the same time can improve services quality and productivity.

Intelligent Transportation System (ITS) include the application of a wide range of new technologies such as traffic reporting via radio or mobile phones, parking guidance and information and automated highway systems. "These can provide a great reduction in congestion as well as variety of transportation improvements" (Ogilvie, 2004 cited by Fadare and Ayantoyinbo, 2010).

Driver Information Systems (DISs) includes reports on traffic conditions that may influence driver's choice of route and vehicle information. On the other word, DISs is used to provide location information and route guidance instructions for the drivers. "DISs can take on many forms which include roadside variable message signs (VMSs), radio broadcasting, internet access, highway radio, SMS and other personal subscribed services" (Luk, Han and Karl, 2008).

2.3.5 High Occupancy Vehicle (HOV) Facilities

"The main purpose of HOV facilities is to maximize the passenger-carrying capacity of the roadway, especially in peak periods" (Sisiopiku, 2012). High Occupancy Vehicle (HOV) lanes are restricted for use by a particular type of vehicles such as buses or trucks and can be used on both motorways and trunk roads. It is intended to encourage for vehicles to carry more than one passenger, for example, commuter car share schemes. HOV lanes are intended to provide fast, reliable travel for the road users at specific times on each day.

3.0 METHODOLOGY

The sources of data for the research are focus on the primary and secondary data. Observation is the primary data that carried out to look at how the occurrences of congestion in the daily life problems and the impacts of congestion to the road users as well as observe the congestion reduction strategies in short term and long term. Data for the analysis were collected from secondary data which main contribute by journal, books and internet resources. First of all, the main methodology for the research consists of a theoretical part that from literature review and conceptual model development. Review of the previous literature about the causes, impacts and strategies of the managing of road traffic congestion was conducted using Google Scholar to achieve many sources. Besides that, data analysis also collected from secondary data such as Emerald Management Plus, JStor, Elsevier Science Direct and others can be linked to enable the access of data through the university online databases and multiple databases. A conceptual framework for the independent variable (causes of congestion) and dependent variable (road traffic congestion) has been developed.

4.0 FINDINGS AND DISCUSSION

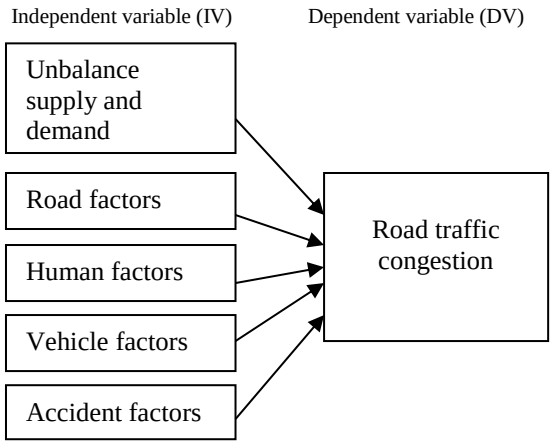

Figure1: Theoretical Framework

Above is a chart regarding the theoretical framework between the causes of congestion and the occurrences of road traffic congestion. The dependent variable (DV) in the research is road traffic congestion and the independent variable (IV) is the causes of congestion. For the independent variable, it includes unbalance supply and demand, road factors, human factors, vehicle factors and accident factors. From this theoretical framework, it explains that the causes that are lead to occur of the road traffic congestion. First, the causes of congestion have long been understood for all the road users and congestion occurs because of unbalance of supply and demand. The usage of the transportation facilities are most needed to drivers during the peak hours, but the supply of the roadway capacity is not sufficient to meet the demand for those facilities. Many of the causes of congestion are due to lack of planning of road. Second, road traffic congestion sometimes is due to the condition of the roads. The road condition can affect drivers' behavior of their own speed on the road. If the road is too narrow or damage, it decrease the speed of the drivers and decrease in traffic flow. Therefore, it will lead to the occurrences of road congestion. The impact of road factors is to slow down vehicle movement and it can also lead to the vehicle breakdown or accidents. Third, congestion is usually caused by bad behavior of the drivers. Human factors are the most complex element of the traffic system and it is hardly to be proper controlled and guided them. Fourth, the vehicle dimensions which can affect the road and traffic which are mainly width, height and length. The width of vehicle affects the width of lanes, shoulders and parking facility. The capacity of the road will decrease if the width of vehicle exceeds the road design and as a result it can cause the occurrences of congestion. Last but not least, another cause of road traffic congestion is due to car accident. Non-recurrent congestion is caused by special events such as car accident and it is usually unexpected. Car accidents can decrease the traffic flows on the road. In order to manage road congestion effectively, the government and road users should be cooperate and pay fully attention on congestion reduction strategies that used to deal with congestion problems.

5.0 CONCLUSION

Congestion is a serious problem which contributes to longer and unpredictable travel times and results in the increased cost of business. Congestion management is not only the individual technical solutions, but also involved public involvement. Congestion mitigation requires an integrated approach and good planning and decision making. According to OECD and ECMT (2004), "the more complex the congestion problem, the higher the levels that need to be incorporated and the broader the scope of planning and decision making required". The successful of solving congestion will depend on how well the government and road users organize to carry out the task they set for themselves. Therefore, the government and road users should pay fully attention on management of congestion reduction strategies that can be used to deal with daily congestion problems.

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